Flap List Troubleshooting

This document describes how to configure and use the Flap List Troubleshooting feature on the Cisco Cable Modem Termination System (CMTS) routers. The flap list is a patented tool for the Cisco CMTS routers to diagnose potential problems with a particular cable modem or with a particular cable interface. The flap list tracks "flapping" cable modems, which are cable modems that have intermittent connectivity problems. Excessive flapping could indicate a problem with a particular cable modem or with the upstream or downstream portion of the cable plant.

- Finding Feature Information, on page 1
- Hardware Compatibility Matrix for the Cisco cBR Series Routers, on page 1
- Prerequisites for Flap List Troubleshooting, on page 2
- Restrictions for Flap List Troubleshooting, on page 2
- Information About Flap List Troubleshooting, on page 3
- How to Configure Flap List Troubleshooting, on page 5
- How to Monitor and Troubleshoot Using Flap Lists, on page 11
- Configuration Examples for Flap List Troubleshooting, on page 17
- Additional References, on page 17
- Feature Information for Flap List Troubleshooting, on page 19

Finding Feature Information

Finding Feature Information

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

Hardware Compatibility Matrix for the Cisco cBR Series Routers

Note The hardware components that are introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.

Table 1: Hardware Compatibility Matrix for the Cisco cBR Series Routers

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-SUP-250G • PID—CBR-CCAP-SUP-160G • PID—CBR-CCAP-SUP-60G	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 CCAP Line Cards: • PID—CBR-LC-8D30-16U30 • PID—CBR-LC-8D31-16U30 • PID—CBR-RF-PIC • PID—CBR-RF-PROT-PIC • PID—CBR-CCAP-LC-40G • PID—CBR-CCAP-LC-40G-R • PID—CBR-SUP-8X10G-PIC • PID—CBR-2X100G-PIC Digital PICs: • PID—CBR-DPIC-8X10G • PID—CBR-DPIC-2X100G Cisco cBR-8 Downstream PHY Module: • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D31-US-MOD

Prerequisites for Flap List Troubleshooting

- To configure and access the flap list using SNMP commands, you must be using an SNMPv3 manager and have configured the Cisco CMTS router for SNMP operations.

Restrictions for Flap List Troubleshooting

- The Flap List Troubleshooting feature can be used only with two-way cable modems. The flap-list does not support telco-return cable modems or set-top boxes.

Note Since the cable flap list was originally developed, polling mechanisms have been enhanced to have an increased rate of 1/sec when polls are missed. Cable modems can go offline faster than the frequency hop period, which can cause the frequency to stay fixed while cable modems go offline. To compensate for this, reduce the hop period to 10 seconds.

Information About Flap List Troubleshooting

This section describes the following information about the Flap List Troubleshooting feature:

Feature Overview

The Flap List Troubleshooting is a patented tool that is incorporated in the Cisco IOS software for the Cisco Cable Modem Termination System (CMTS) routers. The flap list tracks "flapping" cable modems, which are cable modems that have intermittent connectivity problems. A flapping cable modem can indicate either a problem with that particular cable modem, or it could indicate an RF noise problem with the upstream or downstream portion of the cable plant.

The flap-list feature supports any cable modem that conforms to the Data-over-Cable Service Interface Specifications (DOCSIS) because it does use any special messaging to poll cable modems or to request any special information from them. Instead, this feature monitors the normal registration and station maintenance activity that is already performed over a DOCSIS cable network.

This allows the Cisco CMTS to collect the flap-list data without generating additional packet overhead and without impacting network throughput and performance. It also means that although the Flap List Troubleshooting feature is a proprietary feature for Cisco CMTS routers, it is compatible with all DOCSIS-compliant cable modems. In addition, unlike other monitoring methods that use the Simple Network Management Protocol (SNMP), the flap list uses zero bandwidth.

Information in the Flap List

The Flap List Troubleshooting feature tracks the following situations:

- Reinsertions—A reinsertion occurs when the cable modem re-registers more frequently than the user-specified insertion time. A pattern of reinsertions can indicate either potential problems in the downstream or that the cable modem is being improperly provisioned.
- Hits and Misses—A hit occurs when a cable modem successfully responds to the station maintenance messages (MAC-layer "keepalive" messages) that the Cisco CMTS sends out to conform to the DOCSIS standard. A miss occurs when the cable modem does not respond to the request within the user-specified timeout period. A pattern of misses can indicate a potential problem in either the downstream or upstream path, or that a problem can be occurring in the registration process.
- Power Adjustments—DOCSIS cable modems can adjust their upstream transmission power levels to adjust to unstable cable plant signal levels, up to a maximum allowable power level. Repeated power adjustments usually indicate a problem with an amplifier in the upstream return path.

The flap-list feature is automatically enabled, but to use the flap list effectively, the cable system administrator should also typically do the following:

- Set up a script to periodically poll the flap list, for example, every 15 minutes.

- Examine the resulting data and perform trend analysis to identify cable modems that are consistently in the flap list.
- Query the billing and administrative database for cable modem MAC address-to-street address translation and generate a report. The reports can be given to the customer service department or the cable plant's operations and maintenance department. Using these reports, maintenance personnel can quickly discern how characteristic patterns of flapping cable modems, street addresses, and flap statistics indicate which amplifier or feeder lines are faulty. The reports also help to quickly discern whether problems exist in your downstream or upstream path and whether the problem is ingress noise or equipment related.

The flap list provides a quick way to quickly diagnose a number of possible problems. For example, if a subscriber reports a problem, but the flap list for the cable interface that is providing services to them shows little or no flap-list activity, the cable technician can assume that the Cisco CMTS and cable plant are communicating reliably. The problem, therefore, is probably in the subscriber's computer equipment or in the local connection to the cable modem.

Similarly, a cable technician can use the pattern of reinsertions, hits and misses, and power adjustments to quickly troubleshoot the following types of problems:

- If a subscriber's cable modem shows a lot of flap-list activity, it is having some kind of communication problem. Either the cable modem's hardware is faulty, its installation is faulty, the coaxial cable being used is faulty, or some portion of the cable plant that services this cable modem is faulty.
- Focus on the top 10 percent of cable modems that are most active in the flap list, since these are the most likely to indicate consistent and pervasive plant or equipment problems that will continue to disrupt communication with the headend.
- Cable modems with more than 50 power adjustments per day have a suspect upstream path.
- Cable modems with approximately the same number of hits and misses and with a lot of insertions have a suspect downstream path (for example, low level into the cable modem).
- All cable modems incrementing the insertion at the same time indicates a problem with the provisioning servers.
- Cable modems with high cyclic redundancy check (CRC) errors have bad upstream paths or in-home wiring problems.
- Correlating cable modems on the same physical upstream port with similar flap-list statistics can quickly resolve outside plant problems to a particular node or geography.

In addition, the cable network administrators can use the flap list to collect quality control and upstream performance data. Typically, the network operations center (NOC) saves the flap list to a database on a local computer on a daily basis, providing the ability to generate reports that track upstream performance and installation quality control, as well as to provide trend reports on cable plant problems.

Tip The system supports automatic power adjustments. The show cable flap-list and show cable modem commands indicate when the headend cable router has detected an unstable return path for a particular modem and has compensated with a power adjustment. An asterisk (*) appears in the power-adjustment field for a modem when a power adjustment has been made; an exclamation point (!) appears when the modem has reached its maximum power-transmit level and cannot increase its power level any further.

Cisco Cable Manager and Cisco Broadband Troubleshooter

The Flap List Troubleshooting feature is supported by Cisco Cable Manager (CCM), Release 2.0 or later, which is a UNIX-based software suite that manages routers and DOCSIS-compliant cable modems, generates performance reports, troubleshoots connectivity problems, views the network graphically, and edits DOCSIS

configuration files. You can access the CCM locally from the CCM server console or remotely from a UNIX workstation or a PC.

The Flap List Troubleshooting feature also works together with the Cisco Broadband Troubleshooter (CBT), which is a graphical-based application to manage and diagnose problems on the hybrid fiber-coaxial (HFC) network. Radio frequency (RF) technicians can quickly isolate plant and provisioning problems and characterize upstream and downstream trouble patterns, including analyzing flapping modems.

Benefits

The Flap List Troubleshooting feature is a proactive way to manage and troubleshoot problems on an HFC network. Its use of passive monitoring is more scalable and efficient than techniques that send special messages to cable modems or that regularly poll the cable modems using Simple Network Management Protocol (SNMP) commands. Because it uses mechanisms that already exist in a DOCSIS network, it can be used with any DOCSIS-certified cable modem or set-top box.

The flap list provides a cable technician with both real-time and historical cable health statistics for quick, accurate problem isolation and network diagnosis. Using the flap list, a cable technician is able to do the following:

- Quickly learn how to characterize trouble patterns in the hybrid fiber-coaxial (HFC) network.
- Determine which amplifier or feeder line is faulty.
- Distinguish an upstream path problem from a downstream one.
- Isolate an ingress noise problem from a plant equipment problem.

How to Configure Flap List Troubleshooting

This section describes how to configure the flap list operation on the Cisco CMTS. You can use either the command-line interface (CLI) commands or Simple Network Management Protocol (SNMP) commands to configure the flap list, to remove a cable modem from the list, or to clear the flap-list counters.

Configuring Flap List Operation Using the CLI (optional)

To configure the operation of the flap list, use the following procedure, beginning in EXEC mode. This procedure is optional, unless you want to change the default values for the flap list.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**cable flap-list insertion-time** *seconds* **Example:** `Router(config)# cable flap-list insertion-time 3600`	(Optional) Specifies the minimum insertion (registration) time interval in seconds. Any cable modem that makes a registration request more frequently than this period of time is placed in the flap list.
Step 4	**cable flap-list power-adjust threshold** *db* **Example:** `Router(config)# cable flap-list power-adjust threshold 5`	(Optional) Specifies the minimum power adjustment, in dB, that constitutes a flap-list event. **Note** A threshold of less than 2 dB can cause excessive flap-list event recording. If you need to change this parameter from its default, Cisco recommends setting it to 3 dB or higher.
Step 5	**cable flap-list miss-threshold** *misses* **Example:** `Router(config)# cable flap-list miss-threshold 10`	(Optional) Specifies the number of MAC-layer station maintenance (keepalive) messages that can be missed in succession before the CMTS places the cable modem in the flap list. **Note** A high miss rate indicates potential plant problems, such as intermittent upstream problems, fiber laser clipping, or common-path distortion.
Step 6	**cable flap-list aging** *minutes* **Example:** `Router(config)# cable flap-list aging 20160`	(Optional) Specifies how long, in minutes, the Cisco CMTS should keep information for cable modems in the flap list.
Step 7	**cable flap-list size** *number* **Example:** `Router(config)# cable flap-list size 4000`	Specifies the maximum number of cable modems that can be kept in the flap list. **Tip** To avoid wasting processor memory, do not set this value beyond the actual number of cable modems being serviced by the Cisco CMTS.
Step 8	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.

Clearing the Flap List and Counters Using the CLI (optional)

To clear one or more cable modems from the flap list, or to clear the flap list counters for one or more cable modems (while still keeping the modems in the flap list), use the following procedure, beginning in EXEC mode.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

Step 2	**clear cable flap-list** *mac-addr* | **all**} [**save-counters**]
	Example:
	`Router# clear cable flap-list 0102.0304.0506 save-counters`
	Example:
	`Router# clear cable flap-list 000C.0102.0304`
		Clears one or all cable modems from the flap list.

Step 3	**clear cable modem** {*mac-addr* | *ip-addr* | [**cable** *interface*] **all** | **oui***string* | **reject**} } **counters**
	Example:
	`Router# clear cable modem 172.12.23.45 counters`
	Example:
	`Router# clear cable modem oui Cisco counters`
	Example:
	`Router# clear cable modem reject counters`
	Example:
	`Router# clear cable modem c4/0 counters`
	Example:
		Sets the flap-list counters to zero for one or more CMs.

Enabling or Disabling Power Adjustment Using the CLI (optional)

The Cisco CMTS can automatically monitor a cable modem's power adjustments and determine whether a particular cable modem requires a chance in the power adjustment method. To enable a cable interface to make automatic power adjustments, and to set the frequency threshold for when those adjustments are made, use the following procedure, beginning in EXEC mode.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface cable** *x/y* **Example:** `Router(config)# interface cable 4/0`	Enters cable interface configuration mode for the specified cable interface.

Step 4	**cable upstream** *n* **power-adjust** {**continue** *pwr-level* | **noise** *perc-pwr-adj* | **threshold value**}
	Example:
	`Router(config-if)# cable upstream 0 power-adjust threshold 2`
	Example:
	`Router(config-if)# cable upstream 0 power-adjust noise 50`
		Enables automatic power adjustment on an upstream port for this cable interface.
		Note Repeat 4 for each upstream port on the cable interface.

Step 5	**cable upstream** *n* **freq-adj averaging** *percent* **Example:** `Router(config-if)# cable upstream 0 freq-adj averaging 50`	Specifies the percentage of frequency adjustment packets needed to change the adjustment method from the regular power-adjustment method to the automatic power adjustment method.
Step 6	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode.

	Command or Action	Purpose
Step 7	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.

What to do next

Caution The default settings are adequate for system operation. Amplitude averaging is an automatic procedure. In general, Cisco does not recommend that you adjust values. Cisco does recommend, however, that you clean up your cable plant should you encounter flapping cable modems.

Note In some instances, you might adjust certain values for the **cable upstream power-adjust** command: If CMs cannot complete ranging because they have reached maximum power levels, increase the **continue** *pwr-level* parameter beyond the default value of 2 dB. Values larger than 10 dB on "C" versions of cable interface line cards, or 5 dB on FPGA versions, are not recommended. If the flap list shows CMs with a large number of power adjustments, but the CMs are not detected as "noisy," decrease the **noise** *perc-pwr-adj* value. If too many CMs are unnecessarily detected as "noisy," increase the percentage.

Configuring Flap List Operation Using SNMP (optional)

To configure the Flap List Troubleshooting feature on the Cisco CMTS using SNMP, set the appropriate cssFlapObjects attributes in the CISCO-CABLE-SPECTRUM-MIB. the table lists each of the configurable attributes:

Table 2: Flap-List Configuration Attributes

Attribute	Type	Range	Description
ccsFlapListMaxSize	Integer32	1 to 65536[1]	The maximum number of modems that a flap list can support per line card. The default is 100.[2]
ccsFlapListCurrentSize	Integer32	1 to 65536	The current number of modems in the flap list.[3]
ccsFlapAging	Integer32	1 to 86400	The flap entry aging threshold in minutes. The default is 10080 minutes (180 hours or 7 days).
ccsFlapInsertionTime	Integer32	60 to 86400	The worst-case insertion time, in seconds. If a cable modem has not completed the registration stage within this interval, the cable modem is inserted into the flap list. The default value is 90 seconds.
ccsFlapPowerAdjustThreshold	Integer32	1 to 10	When the power of the modem is adjusted beyond the power adjust threshold, the modem is inserted into the flap list.

Attribute	Type	Range	Description
ccsFlapMissThreshold	Unsigned32	1 to 12	When a cable modem does not acknowledge this number of consecutive MAC-layer station maintenance (keepalive) messages, the cable modem is placed in the flap list.

[1] The allowable range when using SNMP for these parameters is 1 to 65536 (a 32-bit value), but the valid operational range is 1 to 8191.
[2] This value is the same as set by the **cable flap-list size** command and is applied only to the command output. The flap list entries displayed via SNMP are not affected by this.
[3] The number of SNMP entries is the same as this value. The number of the CLI entries depends on the value set by **ccsFlapListMaxSize**.

Note **ccsFlapListMaxSize** controls the display of the flap list per downstream cable interface. As long as the number of flap list entries per line card does not exceed 8191, these entries will be stored in the system, and will not be displayed via CLI.

ccsFlapListCurrentSize reflects the number of flap list entries of all the line cards that in the system, regardless of their visibility to the CLI.

Clearing the Flap List and Counters Using SNMP (optional)

To remove a cable modem from the flap list or to clear one or all of the flap-list counters, set the appropriate cssFlapObjects attributes in the CISCO-CABLE-SPECTRUM-MIB. the table lists the attributes that clear the SNMP counters.

Table 3: Attributes to Clear the Flap List

Attribute	Type	Description
ccsFlapResetAll	Boolean	Setting this object to True (1) resets all flap-list counters to zero.
ccsFlapClearAll	Boolean	Setting this object to True (1) removes all cable modems from the flap list, and destroys all entries in the ccsFlapTable. If a modem keeps flapping, the modem is added again into the flap list as a new entry.

Note The ccsFlapLastClearTime attribute contains the date and time that the entries in the ccsFlapTable table were last cleared.

How to Monitor and Troubleshoot Using Flap Lists

Displaying the Flap List Using the show cable flap-list Command

To display the current contents of the flap list, use the show cable flap-list command in privileged EXEC mode. This command has the following syntax:

- **show cable flap-list**—Displays the complete flap list.
- **show cable flap-list sort-interface**—Displays the complete flap list sorted by cable interface.
- **show cable flap-list cable** *interface* **upstream** *port*—Displays the flap list for a specific cable interface, or for a specific upstream port on that cable interface.

To change the way the output is sorted, add one of the following optional keywords:

- **sort-flap**—Sorts the output by the number of times that the cable modem has flapped.
- **sort-time**—Sorts the output by the most recent time that the cable modem flapped.

The following example shows typical output of the **show cable flap-list** command.

```
Router# show cable flap-list
Mac Addr       CableIF Ins    Hit   Miss    CRC  P-Adj   Flap    Time
0010.9500.461f C1/0 U1 56  18857    887      0      1    116 Jun 1  14:09:12
0010.9500.446e C1/0 U1 38  18686   2935      0      1     80 Jun 2  19:03:57
0010.9500.38ec C1/0 U2 63  18932   1040      0      8    138 Jun 2  23:50:53
0010.9500.4474 C1/0 U2 65  18913   1053      0      3    137 Jun 2  09:30:09
0010.9500.4672 C1/0 U2 56  18990   2327      0      6    124 Jun 2  10:44:14
0010.9500.38f0 C1/0 U2 50  18964   2083      0      5    111 Jun 2  20:46:56
0010.9500.e8cb C1/0 U2  0   6537    183      0      1      5 Jun 2  22:35:48
0010.9500.38f6 C1/0 U3 50  19016   2511      0      2    104 Jun 2  07:46:31
0010.9500.4671 C1/0 U3 43  18755   3212      1      1     89 Jun 1  19:36:20
0010.9500.38eb C1/0 U0 57  36133   1608      0      6    126 Jun 2  20:04:58
0010.9500.3ce2 C1/0 U0 44  35315   1907      0      4     99 Jun 2  16:42:47
0010.9500.e8d0 C1/0 U2  0  13213    246      0      1      5 Jun 3  04:15:30
0010.9500.4674 C1/0 U2 56  36037   2379      0      4    121 Jun 3  00:34:12
0010.9500.4677 C1/0 U2 40  35781   2381      0      4     91 Jun 2  12:14:38
0010.9500.4614 C1/0 U2 40  21810   2362      0    502    586 Jun 2  21:43:02
0010.9500.3be9 C1/0 U2 63  22862    969      0      0    128 Jun 1  14:09:03
0010.9500.4609 C1/0 U2 55  22723   2127      0      0    112 Jun 1  14:08:02
0010.9500.3cb8 C1/0 U2 49  22607   1378      0      0    102 Jun 1  14:08:58
0010.9500.460d C1/0 U3 46  22477   2967      0      2     96 Jun 2  17:03:48
0010.9500.3cba C1/0 U3 39  22343   3058      0      0     81 Jun 1  14:13:16
0010.9500.3cb4 C1/0 U3 38  22238   2936      0      0     79 Jun 1  14:09:26
0010.9500.4612 C1/0 U3 38  22306   2928      0      0     79 Jun 1  14:09:29
Router#
```

Displaying the Flap List Using the show cable modem flap Command

To display the contents of the flap list for a specific cable modem, use the **show cable modem flap** command in privileged EXEC mode. This command has the following syntax:

- **show cable modem** [*ip-address* | *mac-address*] **flap**—Displays the flap list for a specific cable modem, as identified by its IP address or MAC address.
- **show cable modem cable***interface* [**upstream** *port*] **flap**—Displays the flap list for all cable modems on a specific cable interface.

Note The **show cable modem flap** command displays information similar to that shown by the **show cable flap-list** command, except it displays this information on a per-modem basis.

The following example shows sample output for the **show cable modem flap** command for a particular cable modem:

```
Router# show cable modem 0010.7bb3.fcd1 flap
MAC Address    I/F       Ins   Hit   Miss  CRC   P-Adj   Flap  Time
0010.7bb3.fcd1 C5/0/U5   0     36278 92    0     369     372   Jun 1  13:05:23 (18000msec)
```

The following example shows sample output for the **show cable modem flap** command for all cable modems on a specific cable interface:

```
Router# show cable modem cable 6/0/0 flap
MAC Address    I/F           Ins   Hit   Miss  CRC   P-Adj   Flap  Time
0025.2e34.4386 C6/0/0/U0     0     46778 3980  0      0      0     (14212 msec)
0025.2e2f.d4b6 C6/0/0/U0     0     48002 1899  0      0      0     (18000 msec)
0025.2e2f.d4de C6/0/0/U0     0     48098 1889  0      0      0     (19552 msec)
0023.bee1.e96b C6/0/0/U0     0     46658 4351  0      0      0     (22432 msec)
0025.2e2f.d4d8 C6/0/0/U0     0     21979 781   0      0      0     ( -- )
0025.2e2f.d48c C6/0/0/U0     0     48048 1835  0      0      0     ( -- )
0025.2e2f.d490 C6/0/0/U0     0     48029 1819  0      0      0     ( -- )
```

Displaying the Flap List Using SNMP

To display the contents of the flap list using SNMP, query the ccsFlapTable table in the CISCO-CABLE-SPECTRUM-MIB. This table contains an entry for each cable modem. the table briefly describes each attribute in this table.

Table 4: cssFlapTable Attributes

Attribute	Type	Description
cssFlapMacAddr	MacAddress	MAC address of the cable modem's cable interface. Identifies a flap-list entry for a flapping cable modem.
ccsFlapUpstreamIfIndex	InterfaceIndex	Upstream being used by the flapping cable modem.
ccsFlapDownstreamIfIndex	InterfaceIndex	Downstream being used by the flapping cable modem.
ccsFlapLastFlapTime	DateAndTime	Time stamp for the last time the cable modem flapped.
ccsFlapCreateTime	DateAndTime	Time stamp that this entry was added to the table.
ccsFlapRowStatus	RowStatus	Control attribute for the status of this entry.

Attribute	Type	Description
ccsFlapInsertionFailNum	Unsigned32	Number of times the CM comes up and inserts itself into the network. This counter is increased when the time between initial link establishment and a reestablishment was less than the threshold parameter configured using the **cable flap-list insertion-time** command or ccsFlapInsertionTime attribute. When the cable modem cannot finish registration within the insertion time (ccsFlapInsertionTime), it resends the Initial Maintenance packet. When the CMTS receives the packet sooner than expected, the CMTS increments this counter.
ccsFlapHitNum	Unsigned32	Number of times the CM responds to MAC-layer station maintenance (keepalive) messages. (The minimum hit rate is once per 30 seconds.)
ccsFlapMissNum	Unsigned32	Number of times the CM misses and does not respond to a MAC-layer station maintenance (keepalive) message. An 8 percent miss rate is normal for the Cisco cable interface line cards. If the CMTS misses a ranging request within 25 msec, then the miss number is incremented.
ccsFlapCrcErrorNum	Unsigned32	Number of times the CMTS upstream receiver flagged a packet with a CRC error. A high value indicates that the cable upstream may have a high noise level. The modem may not be flapping yet, but this could become a possible problem.
ccsFlapPowerAdjustmentNum	Unsigned32	Number of times the cable modem upstream transmit power is adjusted during station maintenance. When the adjustment is greater than the power-adjustment threshold, the number is incremented.
ccsFlapTotalNum	Unsigned32	Number of times a modem has flapped, which is the sum of the following: • When ccsFlapInsertionFailNum is increased • When the CMTS receives a miss followed by a hit • When ccsFlapPowerAdjustmentNum is increased
ccsFlapResetNow	Boolean	Setting this object to True (1) resets all flap-list counters to zero.
ccsFlapLastResetTime	DateAndTime	Time stamp for when all the counters for this particular entry were reset to zero.

Displaying Flap-List Information for Specific Cable Modems

To use SNMP requests to display flap-list information for a specific cable modem, use the cable modem's MAC address as the index to retrieve entries from the ccsFlapTable. Use the following procedure to retrieve flap-list entries for a particular cable modem.

Step 1 Convert the cable modem's MAC address into a dotted decimal string. For example, the MAC address 000C.64ff.eb95 would become 0.12.100.255.235.149.

Step 2 Use the dotted decimal version of the MAC address as the instance for requesting information from the ccsFlapTable. For example, to retrieve the ccsFlapHits, ccsFlapMisses, and ccsFlapPowerAdjustments values for this cable modem, you would make an SNMP request for the following objects:

- ccsFlapHits.0.12.100.255.235.149
- ccsFlapMisses.0.12.100.255.235.149

- ccsFlapPowerAdjustments.0.12.100.255.235.149

Example

Assume that you want to retrieve the same flap-list information as the **show cable flap-list** command for a cable modem with the MAC address of 000C.64ff.eb95:

```
Router# show cable flap-list
MAC Address     Upstream     Ins   Hit   Miss  CRC   P-Adj Flap  Time
000C.64ff.eb95  Cable3/0/U4  3314  55605 50460 0    *42175 47533 Jan 27 02:49:10
Router#
```

Use an SNMP tool to retrieve the ccsFlapTable and filter it by the decimal MAC address. For example, using the standard Unix **getone** command, you would give the following command:

```
csh% getmany -v2c 192.168.100.121 public ccsFlapTable | grep 0.12.100.255.235.149

ccsFlapUpstreamIfIndex.0.12.100.255.235.149 = 15
ccsFlapDownstreamIfIndex.0.12.100.255.235.149 = 17
ccsFlapInsertionFails.0.12.100.255.235.149 = 3315
ccsFlapHits.0.12.100.255.235.149 = 55608
ccsFlapMisses.0.12.100.255.235.149 = 50460
ccsFlapCrcErrors.0.12.100.255.235.149 = 0
ccsFlapPowerAdjustments.0.12.100.255.235.149 = 42175
ccsFlapTotal.0.12.100.255.235.149 = 47534
ccsFlapLastFlapTime.0.12.100.255.235.149 = 07 d4  01 1b   02 33  1a 00
ccsFlapCreateTime.0.12.100.255.235.149 = 07 d4  01 16   03 23  22 00
ccsFlapRowStatus.0.12.100.255.235.149 = active(1)
ccsFlapInsertionFailNum.0.12.100.255.235.149 = 3315
ccsFlapHitNum.0.12.100.255.235.149 = 55608
ccsFlapMissNum.0.12.100.255.235.149 = 50460
ccsFlapCrcErrorNum.0.12.100.255.235.149 = 0
ccsFlapPowerAdjustmentNum.0.12.100.255.235.149 = 42175
ccsFlapTotalNum.0.12.100.255.235.149 = 47534
ccsFlapResetNow.0.12.100.255.235.149 = false(2)
ccsFlapLastResetTime.0.12.100.255.235.149 = 07 d4  01 16   03 20  18 00
csh%
```

To request just one particular value, use the decimal MAC address as the instance for that object:

```
csh% getone -v2c 172.22.85.7 public ccsFlapMisses.0.12.100.255.235.149

ccsFlapMisses.0.12.100.255.235.149 = 50736
csh %
```

Troubleshooting Suggestions

This section provides tips on how to interpret the flap-list counters, as well as how to determine the optimum power level for a flapping cable modem.

Troubleshooting Tips

This section includes suggestions on how to interpret different network conditions based on the flap-list statistics:

- Condition 1: Low miss or hit ratio, low insertion, low P-Adj, low flap counter, and old time stamp. Analysis: This exhibits an optimal network situation.
- Condition 2: High ratio of misses over hits (> 10 percent). Analysis: Hit and miss analysis should be done after the Ins count stops incrementing. In general, if the hit and miss counts are about the same order of magnitude, the upstream can be experiencing noise. If the miss count is greater, then the modem is probably dropping out frequently and not completing registration. The upstream or downstream might not be stable enough for reliable link establishment. Very low hits and miss counters and high insertion counters indicate provisioning problems.
- Condition 3: Relatively high power-adjustment counter. Analysis: Indicates that the power-adjustment threshold is probably set at default value of 2 dB. The modem transmitter step size is 1.5 dB, but the headend can command 0.25 dB step sizes. Tuning your power threshold to 6 dB is recommended to decrease irrelevant entries in the flap list. The power-adjustment threshold can be set using cable flap power threshold <0-10 dB> in the Cisco IOS global configuration mode. A properly operating HFC network with short amplifier cascades can use a 2 to 3 dB threshold.
- Condition 4: High P-Adj and CRC errors. Analysis: This condition can indicate that the fiber node is clipping the upstream return laser. Evaluate the modems with the highest CRC count first. If the modems are not going offline (Ins = 0), this is not noticed by subscribers. However, they could receive slower service due to dropped IP packets in the upstream. This condition also results in input errors on the Cisco CMTS router cable interface.
- Condition 5: High insertion rate. Analysis: If link reestablishment happens too frequently, the modem is usually having a registration problem. This is indicated by a high Ins counter, which tracks the Flap counter.

Performing Amplitude Averaging

The CMTS uses an averaging algorithm to determine the optimum power level for a cable modem with low carrier-to-noise ratio that is making excessive power adjustments—known as flapping. To avoid dropping flapping cable modems, the CMTS averages a configurable number of RNG-REQ messages before it makes power adjustments. By compensating for a potentially unstable return path, the CMTS maintains connectivity with affected cable modems. You can interpret these power adjustments, however, as indicating unstable return path connections.

The **show cable flap-list** and **show cable modem** commands are expanded to indicate to which paths the CMTS is making power adjustments and which modems have reached maximum transmit power settings. These conditions indicate unstable paths that should be serviced.

The following example shows the output of the **show cable flap-list** command:

```
Router# show cable flap-list
MAC Address     Upstream     Ins   Hit   Miss  CRC   P-Adj Flap  Time
 0010.7bb3.fd19  Cable1/0/U1  0     2792  281   0     *45    58    Jul 27 16:54:50
 0010.7bb3.fcfc  Cable1/0/U1  0     19    4     0     !43    43    Jul 27 16:55:01
 0010.7bb3.fcdd  Cable1/0/U1  0     19    4     0     *3     3     Jul 27 16:55:01
```

The asterisk (*) indicates that the CMTS is using the power-adjustment method on this modem. An exclamation point (!) indicates that the modem has reached maximum transmit power.

Output of the **show cable modem** command appears below:

```
Router# show cable modem
 Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
             Sid  State      Offset Power
 Cable1/0/U0 1    online     2257    0.00  3   0   10.30.128.142   0090.8330.0217
 Cable1/0/U0 2    online     2262  *-0.50  3   0   10.30.128.145   0090.8330.020f
 Cable1/0/U0 3    online     2260    0.25  3   0   10.30.128.146   0090.8330.0211
 Cable1/0/U0 4    online     2256   *0.75  3   0   10.30.128.143   0090.8330.0216
 Cable1/0/U0 5    online     2265   *0.50  3   0   10.30.128.140   0090.8330.0214
 Cable1/0/U0 6    online     2256    0.00  3   0   10.30.128.141   0090.8330.0215
 Cable1/0/U0 7    online     4138  !-1.00  3   1   10.30.128.182   0050.7366.124d
 Cable1/0/U0 8    online     4142  !-3.25  3   1   10.30.128.164   0050.7366.1245
 Cable1/0/U0 9    online     4141  !-3.00  3   1   10.30.128.185   0050.7366.17e3
 Cable1/0/U0 10   online     4142  !-2.75  3   0   10.30.128.181   0050.7366.17ab
 Cable1/0/U0 11   online     4142  !-3.25  3   1   10.30.128.169   0050.7366.17ef
```

Similar to the **show cable flap-list** command display, the * symbol in the **show cable modem** command output indicates that the CMTS is using the power-adjustment method on this CM. The ! symbol indicates that the CM has reached maximum transmit power.

Using Other Related Commands

The following related Cisco IOS commands can be used to do maintenance on or display information about a cable modem.

- The following clears the counters for a cable modem (or all cable modems) in the station maintenance list:

```
clear cable modem {mac-addr | ip-addr | all} counters
```

- The following displays the QoS, modem status, In and Out octets, IP and MAC addresses per SID:

```
show int cable slot/port sid
```

- The following drops the modem's RF link by removing a modem from the keepalive polling list. This forces the modem to reset. Note the warning below.

```
clear cable-modem {mac-addr | ip-addr | all} reset
```

Tip The **clear cable-modem** *all* **reset** command causes all modems to go offline and disrupt service for your users. It is best used in a test or nonproduction environment.

- The following uses a MAC-layer ping to determine if the cable modem is online. It uses smaller data units on the wire than a standard IP ping, resulting in lower overhead. This command works even if the IP layer in the modem is down or has not completed registration:

```
ping DOCSIS cable-modem mac-addr | IP address
```

- The following displays the timing offset, receive power, and QoS values by cable interface, SID, and MAC address:

```
show cable modem [ip-address | MAC-address]
```

- The following displays the current allocation table and frequency assignments:

```
show cable spectrum-group [spectrum group number]
```

- The following displays maximum, average, and minimum percent of online time and offline time for a given SID on a given cable router interface:

```
show int slot/port sid connectivity
```

- The following command displays input and output rates, input errors, CRC, frames, overruns, underruns, collisions, interface resets. High input errors in the CMTS retrieved from this query suggest noisy upstream. In older versions of the chassis, loose midplane and line card screws caused a similar problem:

```
show interface slot/downstream-port
```

- The following command displays upstream packet discards, errors, error-free packets, correctable and uncorrectable errors, noise, and micro-reflection statistics.

```
show interface slot/downstream-port upstream
```

Configuration Examples for Flap List Troubleshooting

The following excerpt from a configuration file shows a typical flap-list configuration:

```
!
cable flap-list insertion-time 120
cable flap-list power-adjust threshold 3
cable flap-list miss-threshold 4
cable flap-list aging 8
cable flap-list size 8191
...
```

Additional References

For additional information related to the Flap List Troubleshooting feature, refer to the following references:

Related Documents

Related Topic	Document Title
CMTS Command Reference	Cisco CMTS Cable Command Reference
Cisco Broadband Troubleshooter	http://www.cisco.com/c/en/us/support/cloud-systems-management/broadband-trou

Standards

Standards[4]	Title
ANSI/SCTE 22-1 2012 (formerly SP-RFI-C01-011119)	Data-Over-Cable Service Interface Specification DOCSIS 1.0 Radio Frequency Interface (RFI)
SP-RFIv1.1-I08-020301	Data-over-Cable Service Interface Specifications Radio Frequency Interface Specification
SP-BPI+-I08-020301	DOCSIS Baseline Privacy Interface Plus Specification

[4] Not all supported standards are listed.

MIBs

MIBs[5]	MIBs Link
CISCO-CABLE-SPECTRUM-MIB	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://tools.cisco.com/ITDIT/MIBS/servlet/index

[5] Not all supported MIBs are listed.

RFCs

Description	Link
No new or modified RFCs are supported by this feature.	To locate and download Request for Comments (RFCs) and Internet Drafts, see the Internet Engineering Task Force (IETF) web site at the following URL: http://www.ietf.org/index.html

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Flap List Troubleshooting

Use Cisco Feature Navigator to find information about the platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to the www.cisco.com/go/cfn link. An account on the Cisco.com page is not required.

Note The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 5: Feature Information for Flap List Troubleshooting

Feature Name	Releases	Feature Information
Flap List Troubleshooting	Cisco IOS XE Everest 16.6.1	This feature was integrated intoCisco IOS XE Everest 16.6.1 on theCisco cBR Series Converged Broadband Routers.